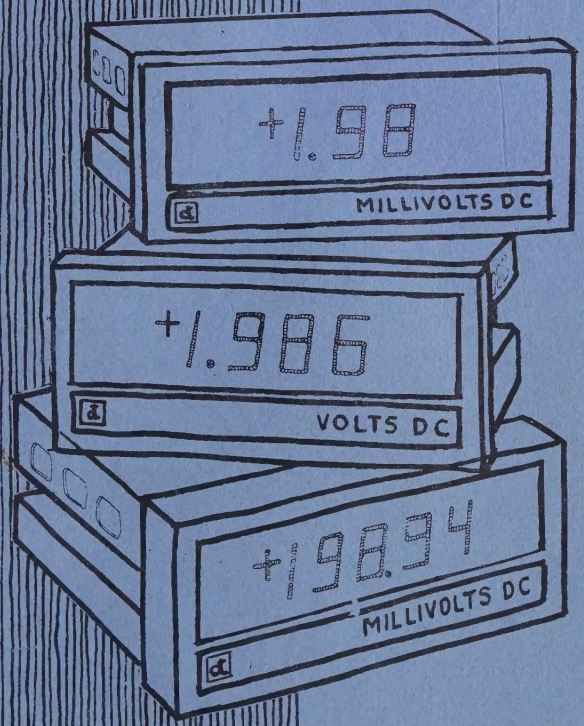
3½ DIGIT

Panel Instrument

MODELS 4311/4312



Instruction Manual

DATA TECH
A DIVISION OF PENRIL CORP.

Instruction Manual

3½ DIGIT

Panel Instrument

MODELS 4311 and 4312

SM2002B P/N 547980

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TABLE OF CONTENTS

Section		Page
	INTRODUCTION	vii
	GENERAL DESCRIPTION AND SPECIFICATIONS	
1-1.	General Description	1-1
1-6.	Input-Output Features	1-1
1-8.	Options	1-1
1-10.	Specifications	1-1
I	INSTALLATION AND OPERATION	
2-1.	Installation	2-1
2-2.	Mounting	2-1
2-4.	Wiring	2-1
2-10.	Operation	2-5
2-12.	Digital Input-Output Lines	2-5
2-14.	BCD Output Lines (13)	2-5
2-16.	OVERRANGE Output Line	2-5
2-18.	POLARITY Output Lines (2)	2-5
2-20.	$\overline{\text{PRINT}}$ Output Line	2-5
2-22.	$\overline{\text{HOLD}}$ Input Line	2-5
2-26.	$\overline{\text{POLARITY INHIBIT}}$ Input Line	2-6
2-28.	DECIMAL POINT Inputs	2-6
II	THEORY OF OPERATION	
3-1.	General Description	3-1
3-2.	Dual Slope Integration	3-1
3-4.	Functional Block	3-1
3-7.	Input Amplifier	3-2
3-11.	Integrator Comparator and Current Source	3-3
3-13.	Digital Circuitry	3-4
3-18.	Reset Generator	3-5
3-20.	Display Circuitry	3-6
3-22.	Power Supply	3-6
V	CALIBRATION AND REPAIR	
4-1.	General	4-1

TABLE OF CONTENTS (Continued)

Section		Page
4-3.	Test Equipment	4-1
4-5.	Calibration	4-1
4-6.	Repair	4-1
4-8.	Factory Repair	4-2

LIST OF ILLUSTRATIONS

Figure		Page
2-1	Mounting	2-1
2-2	Dimensions	2-2
2-3	Connector Mounting	2-3
2-4	PRINT Output Timing	2-5
2-5	Typical $\overline{\text{HOLD}}$ Drive Circuit	2-6
3-1	Dual Slope Integration	3-1
3-2	Functional Block Diagram	3-1
3-3	Input Amplifier	3-2
3-4	Integrator, Comparator, and Current Source	3-3
3-5	Digital Circuitry	3-4
3-6	Timing	3-5
3-7	Reset Generator	3-5
3-8	Display Circuitry	3-6
3-9	Power Supply	3-6
4-1	Meter Front with Bezel Removed Showing Calibration Potentiometers	4-1

LIST OF TABLES

Table		Page
1-1	Model Descriptions	1-1
1-2	Input-Output Lines	1-1
1-3	Specifications	1-2
2-1	Analog Connections	2-4
2-2	Digital Connections	2-4
3-1	Attenuator Values	3-3
4-1	Test Equipment	4-1

INTRODUCTION

This technical manual consists of four sections — I, General Description and Specifications, II, Installation and Operation, III, Theory of Operation, and IV, Calibration and Troubleshooting. These sections describe models 4311 and 4312 Digital Panel Meters manufactured by

DATA TECH— 2700 South Fairview Street, Santa Ana, California 92704

The information contained in Sections I and II is normally all that is required for operating the equipment. Sections III and IV provide data applicable to the equipment's calibration or repair.

SECTION I

GENERAL DESCRIPTION AND SPECIFICATIONS

1-1. GENERAL DESCRIPTION

1-2. The Data Tech models 4311 and 4312 are unipolar and bipolar three and one-half digit panel meters. The meters are available as voltmeters or ammeters. Any of five voltage ranges or six current ranges may be specified. See Table 1-1 for part numbers and input ranges.

Table 1-1. Model Descriptions

Unipolar Model No.'s	Bipolar Model No.'s	Range
4311-01	4312-01	200 mV
4311-02	4312-02	2 V
4311-03	4312-03	20 V
4311-04	4312-04	200 V
4311-05	4312-05	1000 V
4311-06	4312-06	2 μA
4311-07	4312-07	20 μA
4311-08	4312-08	200 μA
4311-09	4312-09	2 mA
4311-10	4312-10	20 mA
4311-11	4312-11	200 mA

1-3. The meter converts the ANALOG INPUT to a digital number and displays that number decimally. The conversion rate is controlled internally at five to six conversions per second; however, an external HOLD control line may be used to terminate conversions. The lights continue to indicate the previous reading when the HOLD is activated.

1-4. The conversion technique employed is "dual slope integration." This technique in conjunction with a conversion rate held in sync with the 60 Hz power frequency yields a significant degree of noise immunity.

1-5. The unit indicates overrange for readings above ±1999 by flashing the most significant digit lamp.

1-6. INPUT-OUTPUT FEATURES

1-7. The standard meter is equipped with a connector through which ac power and analog input connections are made. The decimal point is also established via this connector. The digital lines shown in Table 1-2 are available for use in data gathering systems.

Table 1-2. Input-Output Lines

Input Lines	Output Lines
$\overline{\text{HOLD}}$	POLARITY
$\overline{\text{POLARITY INHIBIT}}$	BCD DATA (13)
	$\overline{\text{PRINT}}$ COMMAND
	OVERRANGE

1-8. OPTIONS

1-9. Only units with a C2 option include connectors for the meter's J1 and J2. Special modifications are incorporated in models with the suffix -2 added to the model number. See Section V for special modifications.

1-10. SPECIFICATIONS

1-11. See Table 1-3.

Table 1-3. Specifications

GENERAL COMMENTS

Unit is non-blinking readout with flashing overrange.

PHYSICAL CHARACTERISTICS

Size ..... 4.787 x 4.05 x 1.8 in
Weight ..... 17 oz
Case Material ..... styrene acrillic butadyne 20% glass filled

ENVIRONMENT

Operating ..... 0 — 55°C @ 80% RH
Storage ..... -10 — +80°C

POWER REQUIREMENTS

Standard ..... 105 — 125V 60Hz @ 5W
Special Option ..... +5Vdc ±5% (inc reg) @ 0.35A (max)
+18Vdc ±1% (inc reg) @ 0.03A (max)
-15Vdc ±1% (inc reg) @ 0.03A (max)
150Vrms ±10% @ 0.030A
Total power approx 6W

ANALOG INPUT CHARACTERISTICS

Analog inputs are "high" and "low" with analog and digital ground interconnected.

Range	Resolution	Input Impedance (Ω)	Input Bias Current (Max)	Maximum Input W/O Damage	
				Continuous	Instantaneous
±199.9mV	100 V	1000M	100pA @25°C	250dc	500Vdc
±1.999V	1mV	1000M	100pA @25°C	250dc	500Vdc
±19.99V	10mV	10M	10pA @25°C	1kVdc	1kVdc
±199.9V	100mV	10M	0	1kVdc	1kVdc
±1000V	1V	10M	0	1kVdc	1kVdc
±1.999μA	1nA	100k	*±150ppm		
±19.99μA	10nA	10k	*±150ppm		
±199.9μA	100nA	1k	*±150ppm		
±1.999mA	1μA	100	*±150ppm		
±19.99mA	10μA	10	*±150ppm		
±199.9mA	100μA	1	*±150ppm		

*Input resistor temperature coefficient per °C.

Table 1-3. Specifications (Continued)

PERFORMANCE

Accuracy

- 24 hr @ 23°C ..... ±(.1% rdg +.05% FS)
- 90 days @ 10 — 40°C
  - Voltage Ranges ..... ±(.1% rdg +.15% FS)
  - Current Ranges ..... ±(.1% rdg +.25% FS)

Conversion Time 10ms

Response Time ..... <250ms

Note

Maximum condition is time from CONVERT COMMAND to PRINT COMMAND; t1-t2 time is 10ms (max).

Read Rate

- Standard 5/s
- Special Option ..... 0.1 — 15/s

Noise Rejection

- NMR ..... 20dB @ 60Hz
- CMR ..... 100dB w/1kΩ unbalance in either input; from 60Hz to 100kHz

DIGITAL I/O LINES

DTL, TTL compatable positive true positive logic levels as follows:

- Logic "1" ..... 2.4 — 5.5V
- Logic "0" ..... 0 — 0.4V
- Output Drive ..... 4TTL loads
- $\overline{\text{HOLD}}$ Input Loading ..... 6mA (max)
- POLARITY Input Loading ..... 3.2mA (max)

Data Lines

- 13 BCD coded lines + polarity

OVERRANGE

- "1" = OVERRANGE
- "0" = In Range

$\overline{\text{PRINT}}$ COMMAND

- "0" = Valid Data Output Levels
- "1" = Unit Converting

Table 1-3. Specifications (Continued)

$\overline{\text{HOLD}}$

"1" (open collector or equiv) = Convert

"0" = Hold Conversions

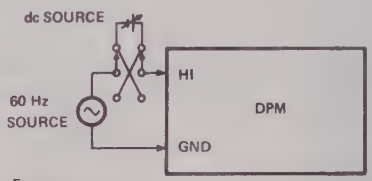
DECIMAL POINT (3)

"0" = Illuminated Decimal Point

Note

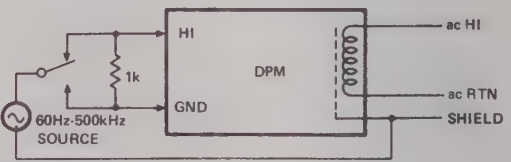
DECIMAL POINT drive circuitry must be able to withstand 90V when open.

TEST CIRCUITS



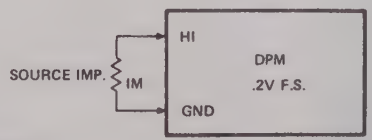
$$\text{NMR dB} = 20 \text{ LOG } \frac{E_{NM\,pk\text{-}pk}}{E\ READOUT_{pk\text{-}pk}}$$

TEST CIRCUIT FOR NMR



$$\text{CMR dB} = 20 \text{ LOG } \frac{E_{CMpk\text{-}pk}}{E\ READOUT\ pk\text{-}pk}$$

TEST CIRCUIT FOR CMR



$$\text{INPUT BIAS} = \frac{E\ READOUT}{\text{SOURCE IMPEDANCE}}$$

TEST CIRCUIT FOR INPUT BIAS

SECTION II

INSTALLATION AND OPERATION

2-1. INSTALLATION

2-2. Mounting (Figure 2-1)

2-3. The meter may be mounted in a 1.682 ±.010 by 3.924 ±.010 inch panel cutout. To mount, remove the snap-on meter bezel; rotate the pawl screws several turns counter clockwise to retract pawls; insert meter in panel; tighten pawl screws, and replace bezel. See Figure 2-2 for dimensions. Do not obstruct the vent holes on either side of the meter case.

2-4. Wiring

2-5. Any of the following connectors may be used for J1:

Elco-Type 00-6007-030-980-002

Viking-Type 2VK15D2/1-2

Masterite-Type MC15D/1-2

Cinch-Type 251-15-30-160

Data Tech Part No. 531768-007

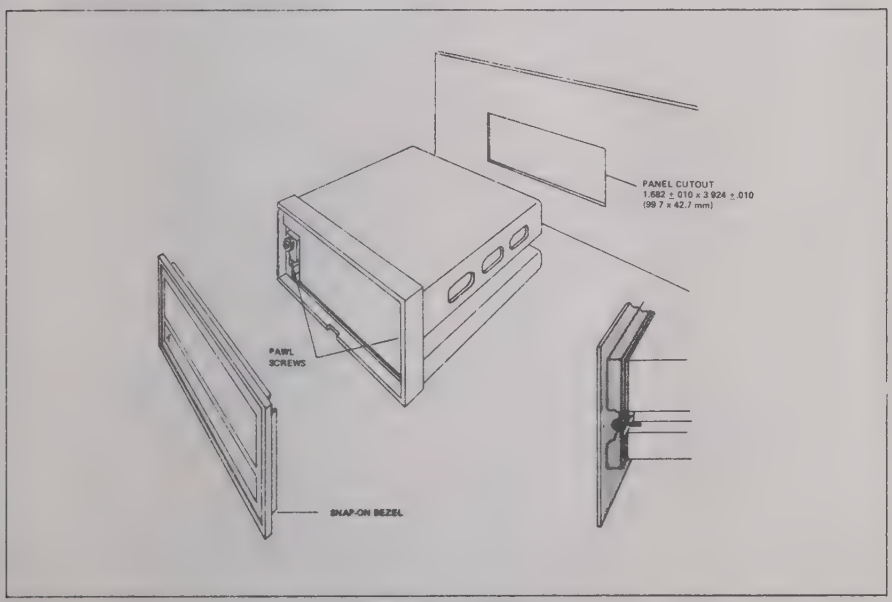


Figure 2-1. Mounting

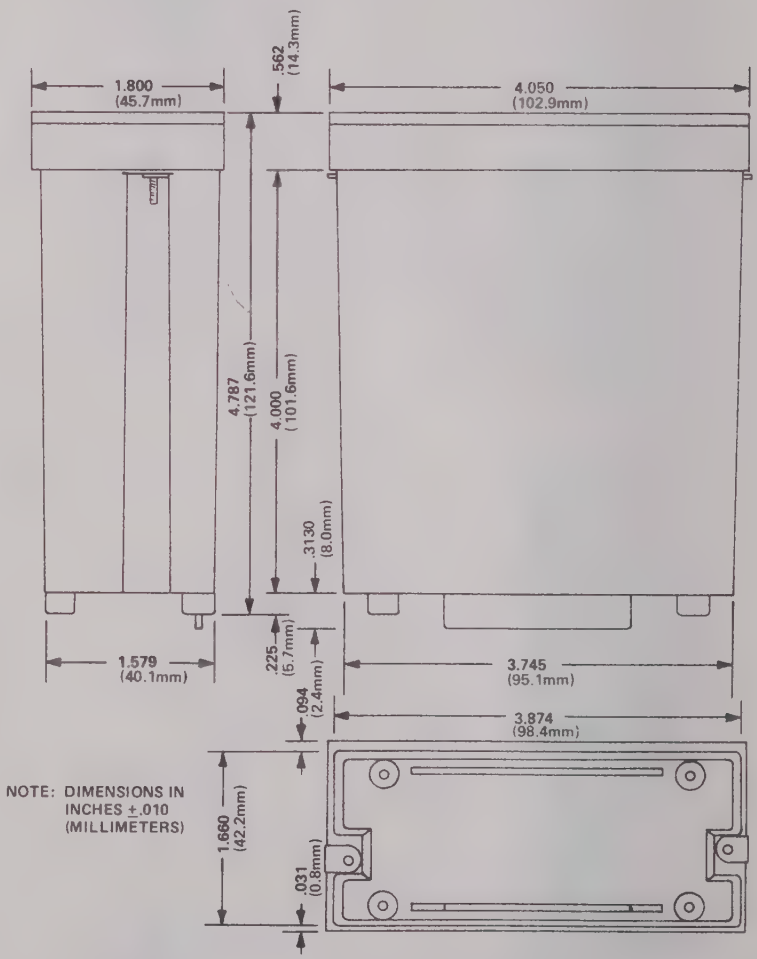


Figure 2-2. Dimensions

2-6. If access to J2's digital input-output lines is required, any of the following connectors may be used:

Elco-Type 00-6007-020-980-002

Viking-Type 2VK10/1-2

Masterite-Type MC10D/1-2

Cinch-Type 251-10-30-160

Data Tech Part No. 531768-006

2-7. These connectors are attachable at the rear of the meter case using the hardware provided. (See Figure 2-3).

2-8. Using Table 2-1, connect 115 volts ac; connect the shield to SYSTEM GROUND; connect the source to be measured between the appropriate ANALOG INPUT and ANALOG GROUND, and, when applicable, establish the decimal point.

2-9. If the digital input-output lines are used, refer to Table 2-2 for pin assignments and paragraph 2-2 for operation. If the model number includes a suffix -2, refer to Section V.

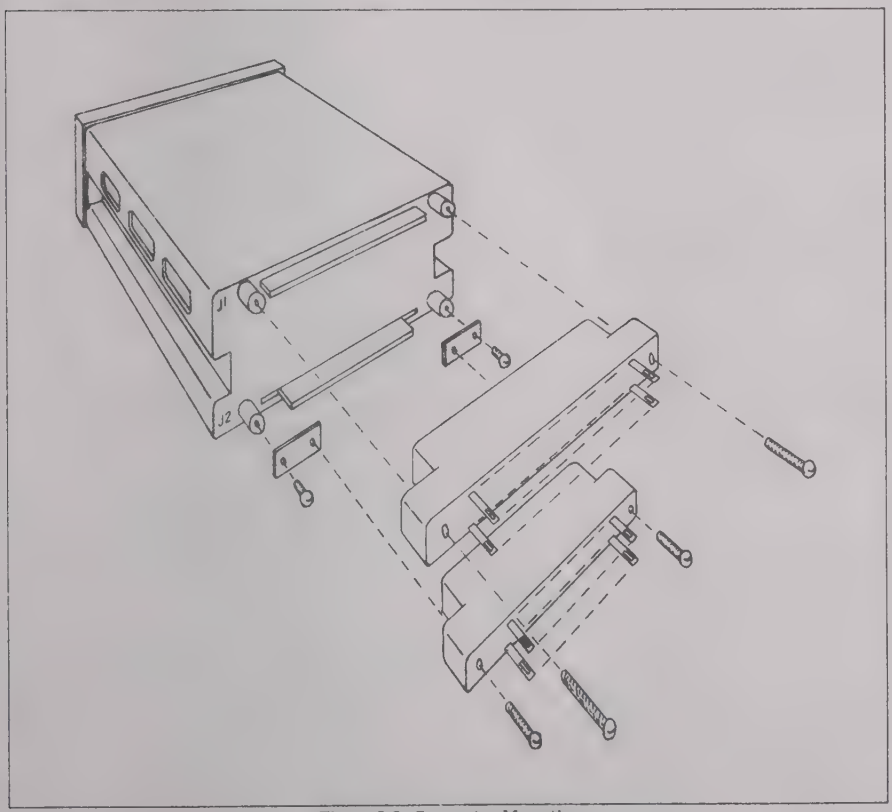


Figure 2-3. Connector Mounting

Table 2-1. Analog Connections

J1 Pin	Signal	J1 Pin	Signal
A	Analog in for 20V, 200V, 1kV Meters	1	-15V
B		2	Analog in for 200mV, 2V and all ammeters
C		3	
D		4	
E		5	
F		6	
H		7	
J		8	
K	400V pk-pk	9	
L		10	ANALOG GND
M	+5V	11	
N	DIGITAL GND	12	GND for Decimal Pt. 188.8
P	+18V	13	GND for Decimal Pt. 18.88
R	SHIELD	14	GND for Decimal Pt. 1.888
S	115V ac RTN	15	115V ac HI

Table 2-2. Digital Connections

J2 Pin	Signal	J2 Pin	Signal
A	4×10^0 BCD DIGIT	1	8×10^0 BCD DIGIT
B	1×10^0 BCD DIGIT	2	2×10^0 BCD DIGIT
C	4×10^1 BCD DIGIT	3	8×10^1 BCD DIGIT
D	1×10^1 BCD DIGIT	4	2×10^1 BCD DIGIT
E	4×10^2 BCD DIGIT	5	8×10^2 BCD DIGIT
F	1×10^2 BCD DIGIT	6	2×10^2 BCD DIGIT
H	$\overline{\text{PRINT}}$	7	$\overline{\text{POLARITY INHIBIT}}$
J	DIGITAL GND	8	$\overline{\text{HOLD}}$
K	POLARITY (+)	9	1×10^3 BCD DIGIT
L	OVERRANGE	10	POLARITY (-)

CAUTION

The dc voltages in Table 2-1 are available at the connector to facilitate flexibility in special situations. These voltages are not intended for use as a source to external systems.

2-10. OPERATION

CAUTION

If the most significant digit lamp flashes, an overrange condition exists. Excessive overrange levels may cause damage to the meter. Remove the ANALOG INPUT and determine that any overrange level is within specified limits. (See Table 1 - 3).

The models 4311-05 and 4312-05 have maximum ranges of 0 to 1000 and ±1000 volts. No overrange flash occurs at >1000 and ≤1999 volts to warn the user. Do not apply analog levels in excess of 1000 volts.

A flashing most significant digit lamp invalidates the displayed number and BCD data.

2-11. No special instructions are required when the DIGITAL INPUT-OUTPUT lines are not used. The units begin operating upon receipt of the inputs prescribed in paragraph 2-4; if not, refer to the warranty for proper action.

2-12. DIGITAL INPUT-OUTPUT Lines

2-13. The DIGITAL OUTPUT lines are DTL and TTL compatable, with positive true positive logic levels as follows:

"1" = 2.4 to 5.5 volts

"0" = 0 to 0.4 volts

2-14. BCD OUTPUT LINES (13)

2-15. The 13 lines labeled BCD DIGIT provide binary coded decimal logic levels representative of the ANALOG INPUT.

2-16. OVERRANGE OUTPUT LINE

2-17. The OVERRANGE line is a "1" for "off scale" readings (greater than 1999 decimally) and a "0" for "in scale" readings.

2-18. POLARITY OUTPUT LINES (2)

2-19. The POLARITY (+) line is a "1" with positive input levels and a "0" with negative levels. The POLARITY (-) line is "0" with positive input levels and a "1" with negative input levels.

2-20. $\overline{\text{PRINT}}$ OUTPUT LINE

2-21. The $\overline{\text{PRINT}}$ line is a "0" during the times the other output lines carry valid data and a "1" during times the output lines are changing due to the conversion process. (See Figure 2-4).

2-22. $\overline{\text{HOLD}}$ INPUT LINE

2-23. A "0" at the $\overline{\text{HOLD}}$ input inhibits conversions. Previous conversion data remains stored and available at the BCD output lines and display when $\overline{\text{HOLD}}$ is made a "0." The next conversion is started 250 milliseconds after $\overline{\text{HOLD}}$ is returned to a "1."

2-24. For single conversion operation, allow the $\overline{\text{HOLD}}$ line to remain a "1" until the $\overline{\text{PRINT}}$ line becomes a "1." Return the $\overline{\text{HOLD}}$ line to a "0" within the following 250 milliseconds to prevent additional conversions. For faster rates, consult Data Tech regarding special modifications.

2-25. The $\overline{\text{HOLD}}$ driving circuitry must be open collector or equivalent. (See Figure 2-5).

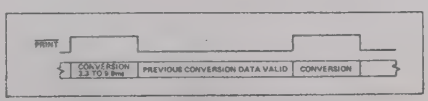


Figure 2-4. PRINT Output Timing

2-26. $\overline{\text{POLARITY INHIBIT}}$ INPUT LINE

2-27. A "-" display as well as negative polarity line output levels are inhibited with the $\overline{\text{POLARITY INHIBIT}}$ input a "0." An open line allows polarity indications and outputs.

2-28. DECIMAL POINT INPUTS

2-29. The drive circuitry to the DECIMAL POINT input, if used, must be capable of withstanding 90 volts when OFF.

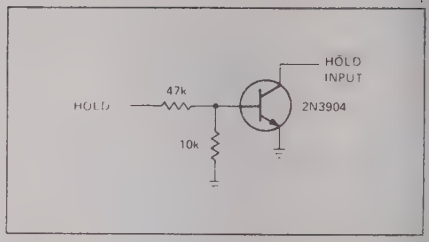


Figure 2-5. Typical $\overline{\text{HOLD}}$ Drive Circuit

SECTION III

THEORY OF OPERATION

3-1. GENERAL DESCRIPTION

3-2. Dual Slope Integration

3-3. The models 4311 and 4312 employ the dual slope integration technique of converting analog levels to digital numbers. See Figure 3-1. The integrating capacitor charges to a level proportional to the ANALOG INPUT during t1 time. During t2 time, the capacitor's charge current is constant and the reverse of t1's current, returning the capacitor to the original level. When the original level (zero detect) is reached, t2's count is displayed, yielding a number corresponding to the ANALOG INPUT.

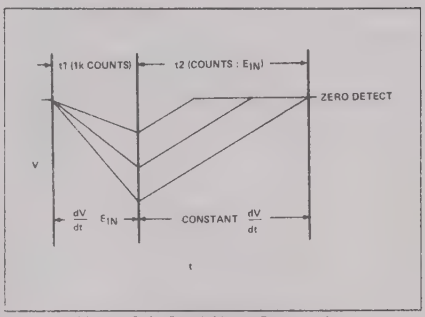


Figure 3-1. Dual Slope Integration

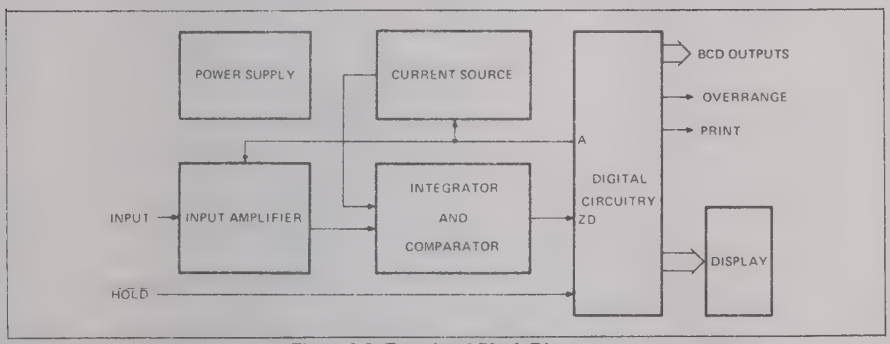


Figure 3-2. Functional Block Diagram

3-4. Functional Block

3-5. A functional block diagram is shown in Figure 3-2. The input amplifier provides unidirectional current to the integrator proportional to the input level during t1 time. The input amplifier also provides polarity data. "A" is a logical "1" during t1 time. With "A" a "1," the integrator's output slope is negative. When "A" returns to a "0," the input amplifier is decoupled and the current source causes the integrator's slope to reverse. When the integrator returns to the original level, the comparator transmitts ZERO DETECT (ZD).

3-6. The digital circuitry contains a counter that establishes t1 time. ZD stops the counter leaving t2's counts stored in the counter's flip-flops. The counter's BCD outputs are decoded for a decimal display. An internal reset generator resets "A" to a "1" and all other outputs to "0's" to restart the conversion process.

3-7. INPUT AMPLIFIER (Figure 3-3)

3-8. The input amplifier circuit consists of an attenuator input to a voltage follower amplifier. The follower amplifier has descrete FET input circuitry (Q18) and is not as shown in Figure 3-3. See drawings 547959 and 547929 for the actual circuitry. The voltage at the output of the attenuator appears across the Gm resistors. When the input is positive, current flows through CR4, Q3, Q4, and the Gm resistors. Negative input levels cause conduction of Q5 and Q6. Current flow is through R22, R20, Q6A, and the Gm resistors and duplicated through CR4, Q6B, R21, and R22. Thus, output current through CR4 is unipolar.

3-9. When "A" is a "0," (t2 time) Q2 is ON and CR4 is non-conductive, decoupling the input amplifier. Q1 is ON when the input is positive and OFF when the input is negative, supplying polarity information. Note that Q1 is held OFF during t1 time, when "$\overline{A}$" is a logical "0," via CR3 and R28. The polarity is thus transmitted at the beginning of t2 time.

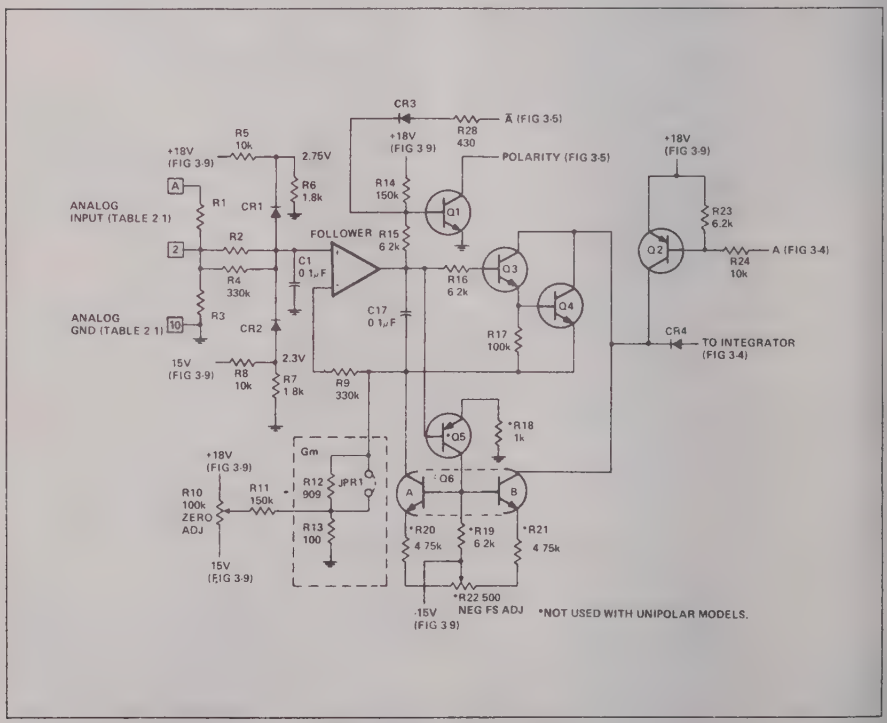


Figure 3-3. Input Amplifier

3-10. Attenuator resistor values differ with the various models. See Table 3-1 for attenuator values. Note that the jumper is out for ±2 volt models thus reducing the integration current or current gain (Gm) for this model.

3-11. INTEGRATOR COMPARATOR AND CURRENT SOURCE (Figure 3-4)

3-12. The comparator amplifier (A2) has a gain of 2000 controlled by R34 and R35. Offset — due to the current through R35 generated by the source formed by Q9, Q10, R29, and R31 — sets the input threshold at +9 volts. During t1 time, "A" is a "1" (+18 volts), Q7 is OFF, and CR4 is conducting. C3 integrates in the negative direction due to current to the input amplifier. During t2 time, "A" is a "0," CR4 non-conductive, and the current source, formed by Q7, Q8, R26, and R27, causes C3 to integrate in the positive direction. When C3 reaches +9 volts, the comparator switches state, turning Q7 OFF, via CR10 and CR7, and transmitting $\overline{ZD}$. Following $\overline{ZD}$, Q7 is set in a mode of operation that maintains C3 at 9 volts. $\overline{ZD}$ can be made a "0" when the comparator output is a "1" or when OVERRANGE is a "1." Q11 inverts "$\overline{A}$" to obtain "A."

Table 3-1. Attenuator Values

Range	R1	R2	R3	Jumper	Input
±200 mV	open	open	open	in	2
±2 V	open	open	open	out	2
±20 V	10 M	750 k	101 k	in	A
±200 V	10 M	open	10 k	in	A
±1000 V	10 M	open	1 k	in	A
±2 μA	open	750 k	100 k	in	2
±20 μA	open	open	10 k	in	2
±200 μA	open	open	1 k	in	2
±2 mA	open	open	100Ω	in	2
±20 mA	open	open	10Ω	in	2
±200 mA	open	open	1Ω	in	2

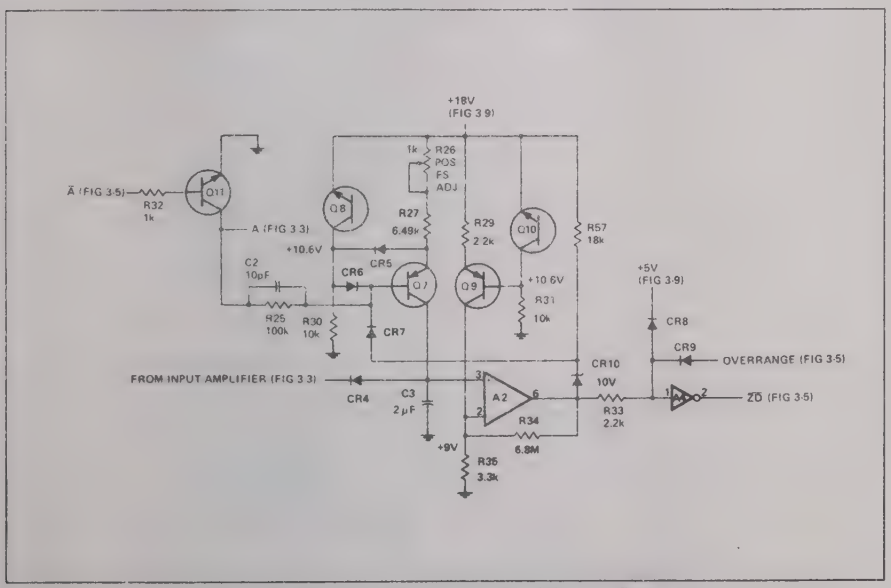


Figure 3-4. Integrator, Comparator, And Current Source

3-13. DIGITAL CIRCUITRY (Figure 3-5)

3-14. The digital circuitry employs a counter comprised of three divide-by-ten, one divide-by-five, and one divide-by-two stage. The reset generator resets outputs 1 through 1000, OVERRANGE, and "$\overline{A}$" to logical "0's" and sets POLARITY to a "1" (+).

3-15. With RESET, "$\overline{A}$" resets the ZD flip-flop, enabling the clock circuit. After 1000 clocks, (t1 time) "A" returns to a "1," performing the switch functions that decouple the input amplifier and enable the current source. Unless Q1 is ON, "$\overline{A}$" also clocks the POLARITY output to a "0" (-) after the above 1000 clocks. For positive polarities, Q1 inhibits this clock. Q12, Q13, and Q14 are display drivers, with displays ON when the corresponding transistor is ON.

3-16. When $\overline{ZD}$ goes to a "0," the ZD flip-flop sets, inhibiting the clock circuit and terminating the count. The BCD logic levels representing the t2 count remain stored in the counter until the next RESET.

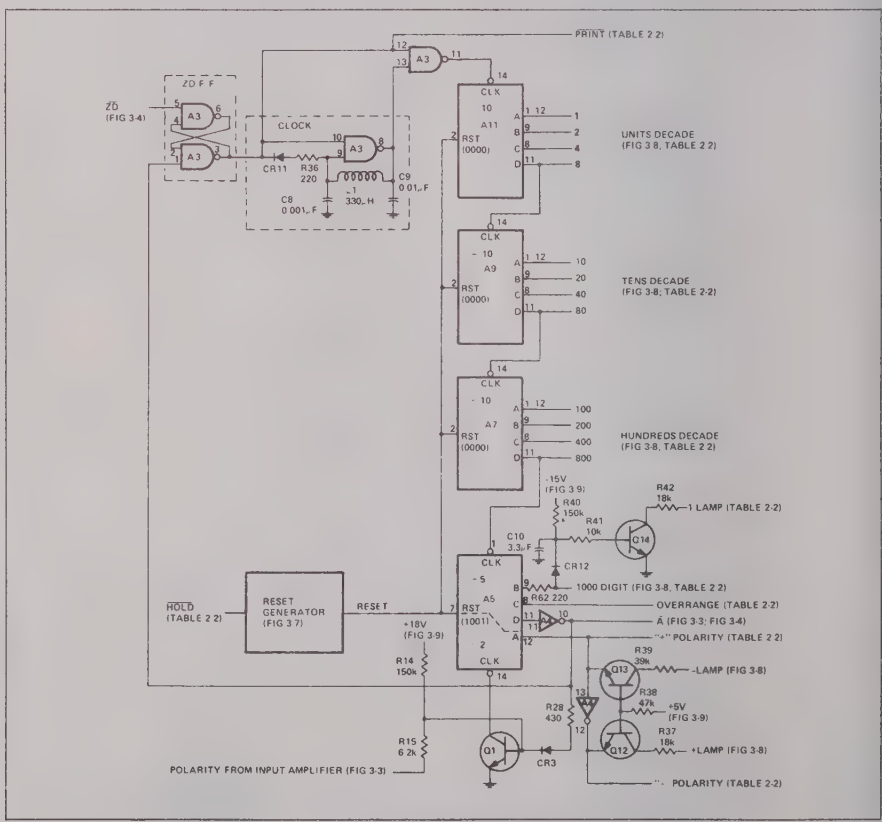


Figure 3-5. Digital Circuitry

3-17. If a ZD is not transmitted within 2000 counts after t1, the 1000 output goes to a "0," clocking OVERRANGE to a "1" and setting the ZD flip-flop. The turning ON and OFF of the 1000 output with clocking into OVERRANGE produces a flashing of the 1000's lamp. See Figure 3-6 for timing.

3-18. Reset Generator (Figure 3-7)

3-19. Q15 is a programmable unijunction that turns ON when C11 charges to the trigger level established by program resistors R48 and R50. With Q15 ON, C11 discharges turning Q15 OFF. R47 and C11 determine the reset rate and are normally selected for about five conversions per second. The 60 hertz signal is amplified for squaring purposes and supplied to Q15's gate. This signal in turn syncs reset — and thus the conversion rate — to the ac power line frequency. When the $\overline{\text{HOLD}}$ line is grounded, Q15 is inhibited, with the charge of C11 held below the trigger level.

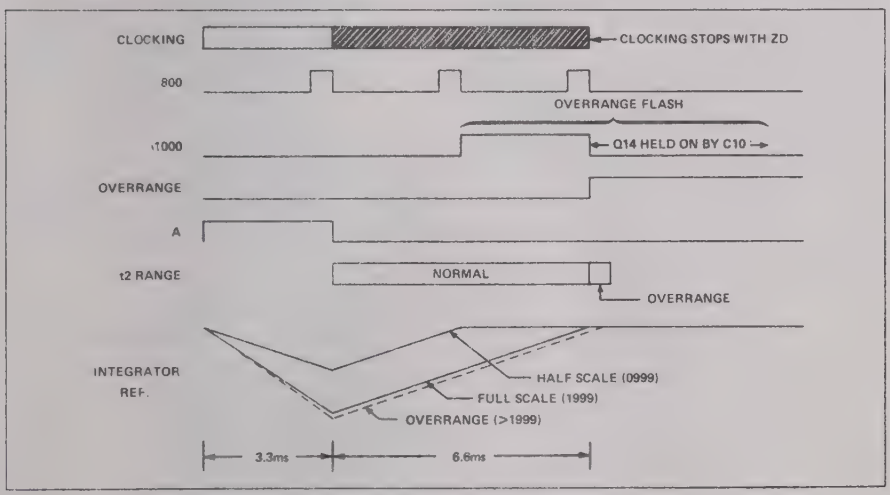


Figure 3-6. Timing

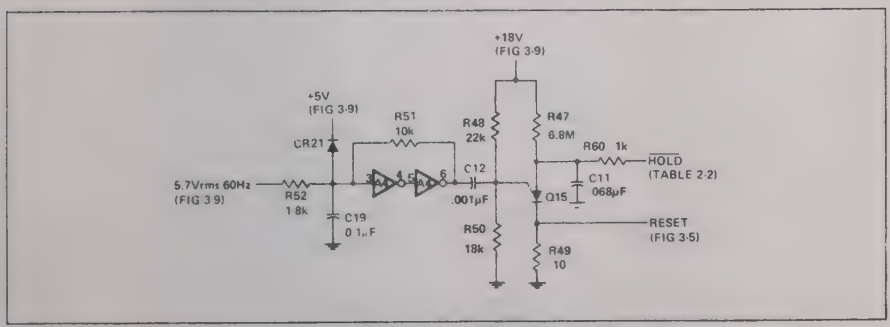


Figure 3-7. Reset Generator

3-20. DISPLAY CIRCUITRY (Figure 3-8)

3-21. BCD to seven segment converters convert the counter's BCD outputs to numbers that yield decimal lamp readouts. Lamps are ON when lamp inputs are "0." Circuitry for polarity and most significant digit is shown in Figure 3-5.

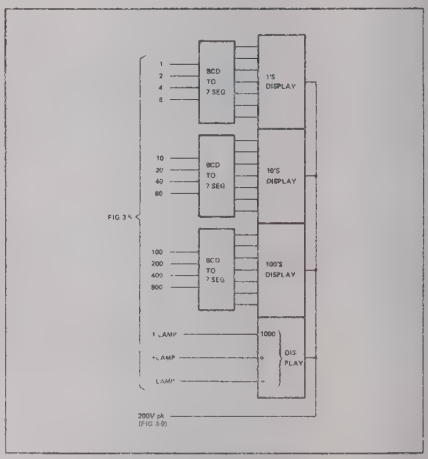


Figure 3-8. Power Supply

3-22. POWER SUPPLY (Figure 3-9)

3-23. The +18 and -15-volt supplies employ capacitance input filters to half-wave rectifiers. The +5-volt supply employs full-wave rectifiers to a capacitance input filter. The +200-volt supply employs half-wave rectification with no filtering or regulation. Regulation of the +18, and +5-volt supplies is via zener controlled pass transistors (Q16, Q17, CR13, and CR14). The -15-volt supply is regulated by a shunt zener diode (CR15). The display requires -200 volts to maintain ionization stability. This voltage is via a bridge rectifier (CR20, CR23, CR24, and CR25) and capacitor filter (C18).

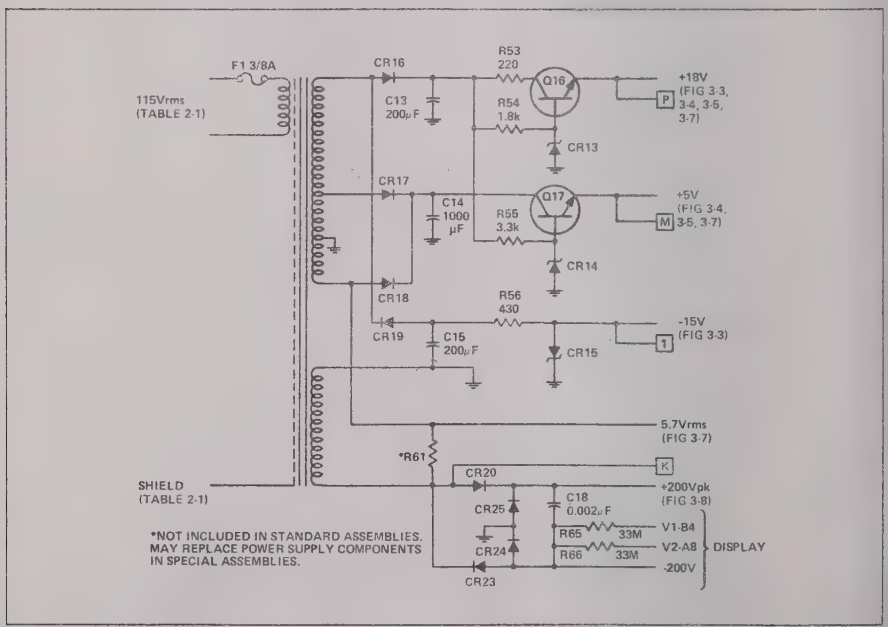


Figure 3-9. Power Supply

SECTION IV

CALIBRATION AND REPAIR

4-1. GENERAL

4-2. The accuracy of the meter should be established at 90 day intervals. Accuracy is confirmed when known inputs yield corresponding displays, within specified accuracy.

4-3. Test Equipment

4-4. Test equipment suitable for calibration or repair is specified in Table 4-1. Substitute equipment must be consistant with the required measurement accuracy.

Table 4-1. Test Equipment

Manufacturer	Description
Data Tech	Model 350 digital voltmeter
Fluke	Model 332A voltage standard
Fluke	Model 382A current standard
Tektronix	Type 545 oscilloscope with Type "W" preamplifier

4-5. CALIBRATION (Figure 4-1)

1. Remove the snap-on bezel.
2. Connect the ANALOG INPUT to the GROUND terminal.
3. Initiate 115 volt ac power ON.
4. Adjust R10 for a display of 000 with the "+" and "-" displays toggling.
5. Remove the connections to the ANALOG INPUT.

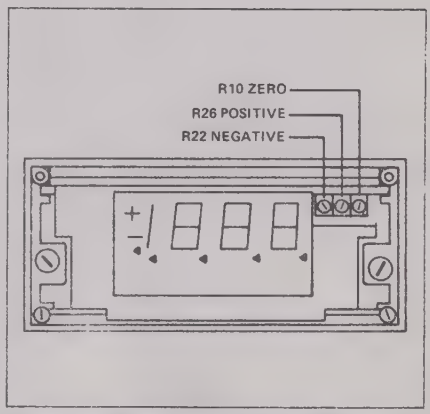


Figure 4-1. Meter Front With Bezel Removed Showing Calibration Potentiometers

6. Using the voltage standard for voltmeters or the current standard for ammeters, provide the ANALOG INPUT necessary for a +1900 display.
7. Adjust R26 for a +1900 display.
8. If the meter is bipolar, repeat step 6, providing a -1900 input. Adjust R22 for a -1900 display.

4-6. REPAIR

Note

Before attempting any repairs, read the warranty provisions and conditions on page iii.

4-7. Section III of the manual devotes a paragraph to each functional block of the meter. Verify operation of these blocks using Section III.

CAUTION

When the case assembly must be removed, difficulty may be encountered in the unit's reassembly. This difficulty is due to a taper in both the printed wire board and the case slots provided for positioning this board. The slots do not guide the board into the case until a substantial portion of the board assembly is in the case. Misallignment of the board is, therefore, likely unless care is taken. The recommended installation procedure is to position the case with the long meter face axis alligned vertically. Rest the boards in the lower slots and gradually slide the board assembly toward the rear of the case while maintaining board allignment with the upper slots. Very slight resistance is encountered with correct allignment. Do not force.

4-8. Factory Repair

4-9. Data Tech maintains a factory repair facility. Factory repairs seldom require more than a week. Experience shows factory repair of equipment to be best, and Data Tech urges customers to only attempt their own repairs when circumstances prevent the equipment's return to the factory. Refer to the customer service card inside the back cover for equipment return instructions.

SECTION V

SPECIAL MODIFICATIONS

(To Be Filled In When Units Are Modified)

Description of Modification(s)

Changes in Specified Operation(s)

Drawings Applicable to Modification(s)

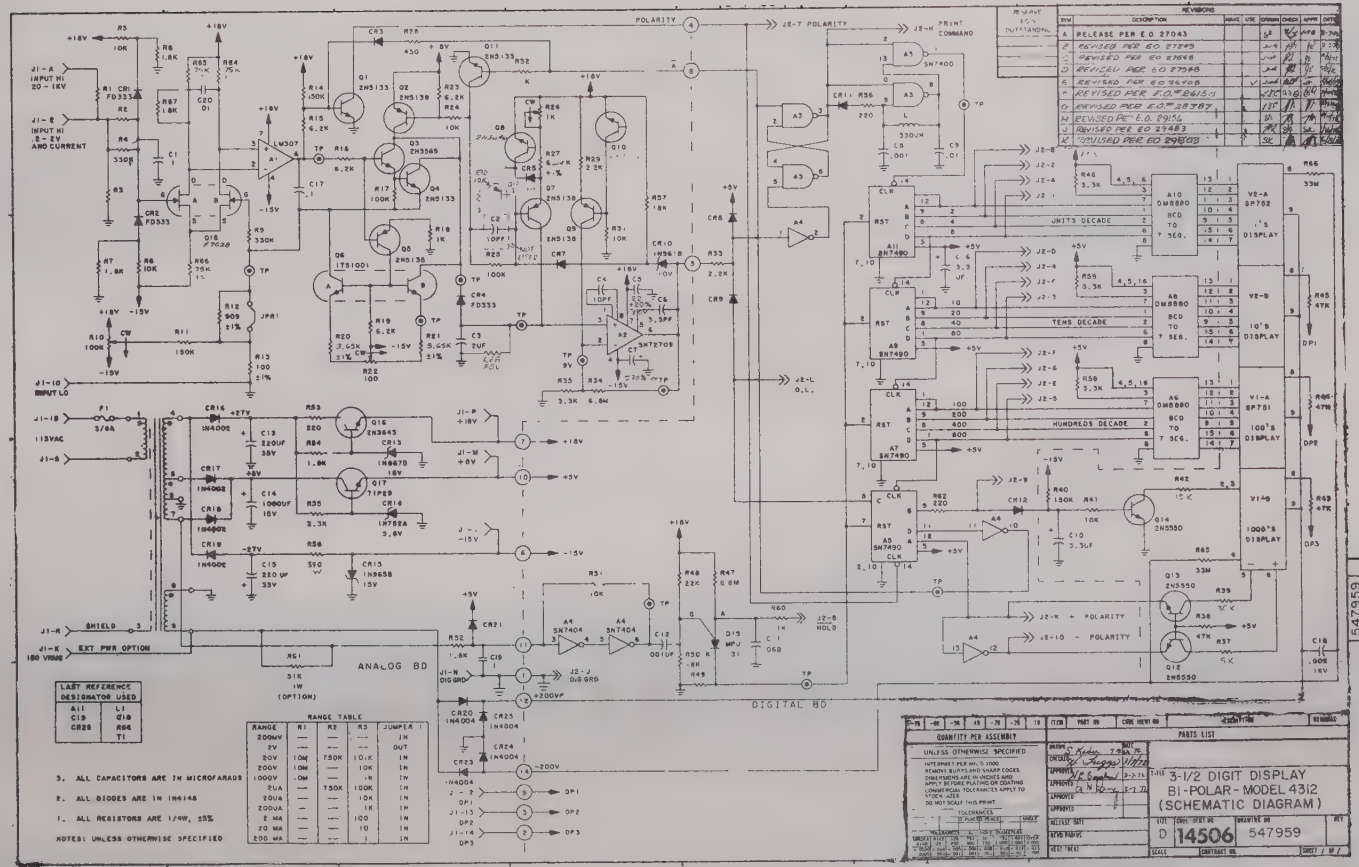
SECTION VI
DRAWINGS AND PARTS LISTS

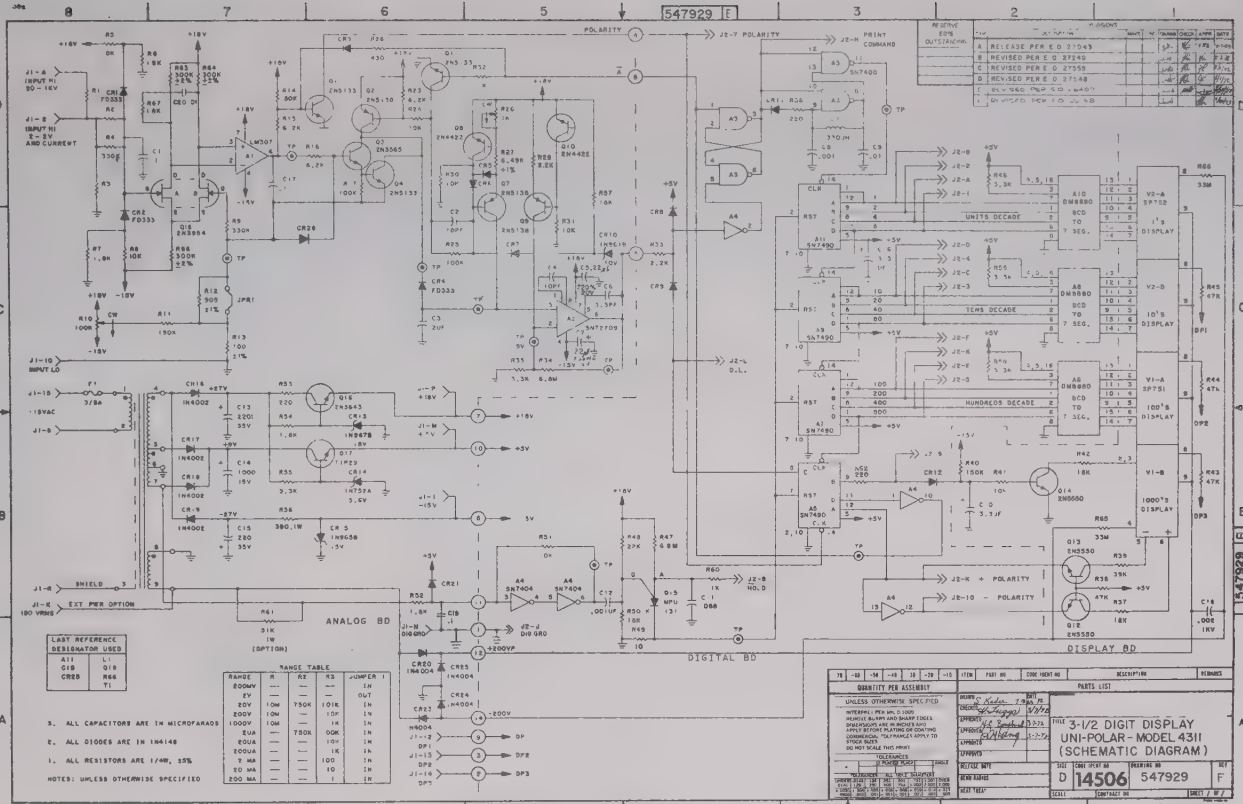
6-1. GENERAL

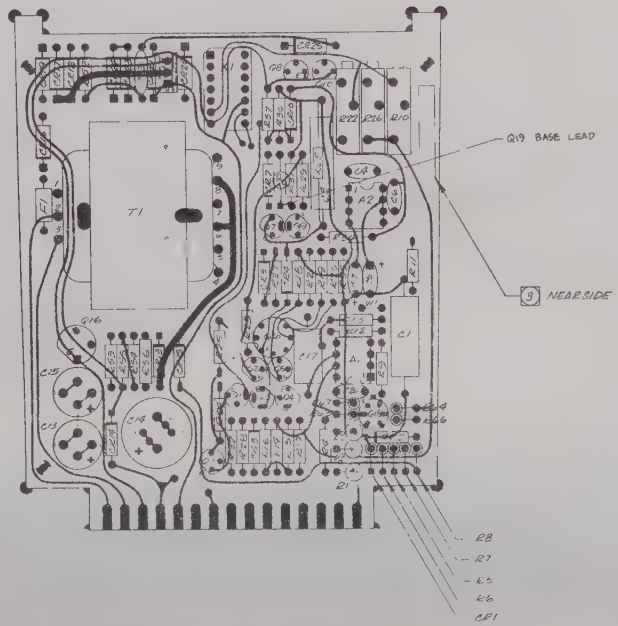
6-2. This section contains schematics, layout drawings and parts lists for the models 4311 and 4312 sub-assemblies.

6-3. DRAWINGS AND PARTS LISTS

Drawing Number	Title
547959	3-1/2 Digit Display Bi-Polar — Model 4312 (Schematic Diagram)
547929	3-1/2 Digit Display Uni-polar — Model 4311 (Schematic Diagram)
547932 page 2	Analog Board Sub-Assembly, 3-1/2 Digit Display, Model 4312 (Bipolar)
547932 M (ref)	Analog Board Sub-Assembly, Parts List (Bipolar)
547931 page 2	Analog Board Sub-Assembly, 3-1/2 Digit Display, Model 4311 (Unipolar)
547931 K (ref)	Analog Board Sub-Assembly, Parts List (Unipolar)
547832 page 2	Mother Board Sub-Assembly, 3-1/2 Digit Display, Model 4311 and Model 4312
547832 E (ref)	Mother Board Sub-Assembly, Parts List
547834 page 2	Display Board Sub-Assembly, 3-1/2 Digit Display, Model 4311 and Model 4312
547834 B (ref)	Display Board Sub-Assembly, Parts List


REVISIONS
DESCRIPTION
A RELEASE PER E.O. 27043
B REVISED PER E.O. 27249
C REVISED PER E.O. 27546
D REVISED PER E.O. 27598
E REVISED PER E.O. 28498
F REVISED PER E.O. 28615
G REVISED PER E.O. 28787
H REVISED PER E.O. 29154
J REVISED PER E.O. 29483
K REVISED PER E.O. 29603
ANALOG BD
DIGITAL BD
UNITS DECADE
TENS DECADE
HUNDREDS DECADE
1's DISPLAY
10's DISPLAY
100's DISPLAY
POLARITY
PRINT COMMAND
HOLD
+ POLARITY
- POLARITY
SHIELD
EXT PWR OPTION
LAST REFERENCE DESIGNATOR USED
RANGE TABLE
NOTES: UNLESS OTHERWISE SPECIFIED
3. ALL CAPACITORS ARE IN MICROFARADS
2. ALL DIODES ARE IN IN4148
1. ALL RESISTORS ARE 1/4W, 5%
QUANTITY PER ASSEMBLY
PARTS LIST
3-1/2 DIGIT DISPLAY
BI-POLAR- MODEL 4312
(SCHEMATIC DIAGRAM)
14506
547959


547929 F
547929 E
ANALOG BD
DIGITAL BD
DISPLAY BD
POLARITY
PRINT COMMAND
UNITS DECADE
TENS DECADE
HUNDREDS DECADE
J1-A INPUT HI 50 - 1KV
J1-B INPUT HI 2 - 8V AND CURRENT
J1-10 INPUT LO
115VAC
SHIELD
EXT PWR OPTION
100 VRMS
J2-K + POLARITY
J2-10 - POLARITY
J2-L O.L.
J2-M HOLD
J2-d DVD GRD
J1-M DIGGRD
RESERVE EDN OUTSTANDING
REVISIONS
A RELEASE PER E O 27043
B REVISED PER E O 27240
C REVISED PER E O 27559
D REVISED PER E O 27548
E REVISED PER E O 27640
F REVISED PER E O 27548
LAST REFERENCE DESIGNATOR USED
RANGE TABLE
NOTES: UNLESS OTHERWISE SPECIFIED
1. ALL RESISTORS ARE 1/4W, 5%
2. ALL DIODES ARE IN 4148
3. ALL CAPACITORS ARE IN MICROFARADS
PARTS LIST
UNLESS OTHERWISE SPECIFIED
3-1/2 DIGIT DISPLAY
UNI-POLAR - MODEL 4311
(SCHEMATIC DIAGRAM)
D 14506 547929 F


Q19 BASE LEAD
9
NEARSIDE
T1
C1
C14
C15
C13
C16
R8
R10
R22
R26
R11
R12
R13
R14
R15
R16
R17
R18
R19
R20
R21
R23
R24
R25
R27
R28
R29
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R31
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R59
R60
R61
R62
R63
R64
R65
R66

Model 4312

Description Analog Board Sub-Assembly

REPLACEABLE PARTS LIST

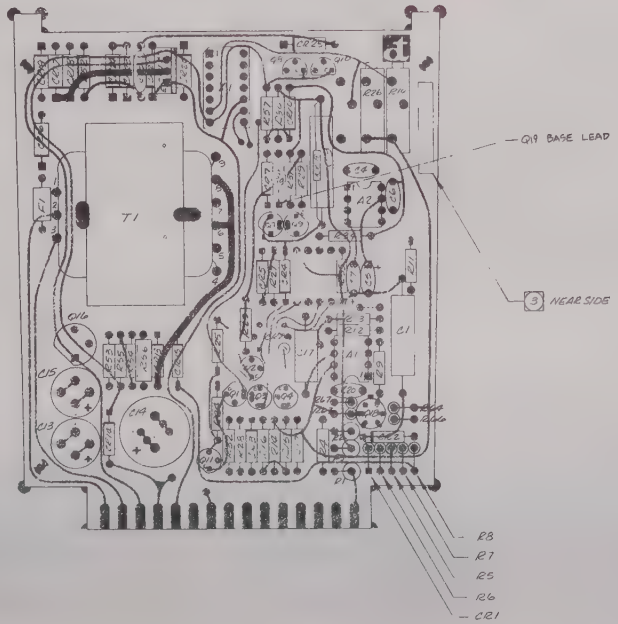
Data Tech No	Description	Source 1		Source 2		Source 3	
		Code Ident	Mfg & Type	Code Ident	Mfg & Type	Code Ident	Mfg & Type
531986-003	R1 res. (20V, 200V, 1000V) 10M, 1%	03888	Pyrofilm PME70				
503100-754	R2 res. (20V, 2μA) 750k 1/4W, 5%	01121	Allen Bradley CB7545	09021	Airco Speer 4R7541		
817047-380	R3 res. (20V) 101k 1/8W, 1%	19701	Electra/Midland Corp. MF6C				
817047-370	R3 res. (2μA) 100k 1/8, 1%	19701	Electra/Midland Corp. MF6C				
817046-320	R3 res. (200V, 20μA) 10k 1/8W, 1%	19701	Electra/Midland Corp. MF6C				
817045-310	R3 res. (1000V) 1k 1/8W, 1%	19701	Electra/Midland Corp MF6C				
817045-310	R3 res. (200μA) 1k 1/8W, 1%	19701	Electra/Midland Corp. MF6C				
817044-300	R3 res. (2mA) 100 ohms 1/8W, 1%	19701	Electra/Midland Corp. MF6C				
817044-960	R3 res. (20mA) 10 ohms 1/8W, 1%	19701	Electra/Midland Corp MF6C				
819126-010	R3 res. (200mA) 1 ohm 1/2W, 1%	19701	Electra/Midland Corp. MF6C				
503100-334	R4, 9 res. 330k 1/4W, 5%	01121	Allen Bradley CB3345	09021	Airco Speer 4R334J		
503100-103	R5, 8, 24, 30, 31 res. 10k 1/4W, 5%	01121	Allen Bradley CB1035	09021	Airco Speer 4R103J		
503100-182	R6, 7, 52, 54, 67 res. 1.8k 1/4, 5%	01121	Allen Bradley CB1825	09021	Airco Speer 4R182J		
531866-014	R10 res. 100k variable	73138	Beckman Instruments 89PR100K				

Data Tech No	Description	Source 1		Source 2		Source 3	
		Code Ident	Mfg & Type	Code Ident	Mfg & Type	Code Ident	Mfg & Type
503100-154	R11, 14 res. 150k 1/4W, 5%	01121	Allen Bradley CB1545	09021	Airco Speer 4R154J		
531722-190	R12 res. 909 ohms 1% RN55D	14674	Corning Glass Works Co. TYPE NA55	80031	Mepco Inc. Style FE10 or MR31		
531722-099	R13 res. 100 ohms 1% RN55D	14674	Corning Glass Works Co. Type NA55	80031	Mepco Inc. Style FE10 or MR31		
503100-104	R17, 25 res. 100k 1/4W, 5%	01121	Allen Bradley CB1045	09021	Airco Speer 4R104J		
503100-102	R18, 32 res. 1k 1/4W, 5%	01121	Allen Bradley CB1025	09021	Airco Speer 4R102J		
503100-622	R19, 15, 16, 23 res. 6.2k 1/4W, 5%	01121	Allen Bradley CB6225	09021	Airco Speer 4R622J		
531722-248	R20, 21 res. 3.65k, 1% RN55D	14674	Corning Glass Works Co. Type NA55	91637	Dale Electronics MF-1/10		
531866-004	R22 res. 100 ohms	73138	Beckman Instruments 89PR100				
531866-007	R26 res. 1k variable	73138	Beckman Instruments 89PR1K				
531772-269	R27 res. 6.04K, 1%	14674	Corning Glass Works Co. Type NA55	80031	Mepco Inc. Style FE10 or MR31		
503100-431	R28 res. 430 ohms 1/4W, 5%	01121	Allen Bradley CB4315	09021	Airco Speer 4R431J		
503100-222	R29 res. 2.2k 1/4W, 5%	01121	Allen Bradley CB2225	09021	Airco Speer 4R222J		
503100-685	R34 res. 6.8M 1/4W, 5%	01121	Allen Bradley CB6855	09021	Airco Speer 4R685J		
503100-332	R35, 55 res. 3.3k 1/4W, 5%	01121	Allen Bradley CB3325	09021	Airco Speer 4R332J		
503100-221	R53 res. 220 ohms 1/4W, 5%	01121	Allen Bradley CN2215	09021	Airco Speer 4R221J		
530213-391	R56 res. 390 ohms, 5%	56289	Sprague 239E3915				
532050-437	R63, 64, 66 res. 75K, 1%		RN55C				

Data Tech No	Description	Source 1		Source 2		Source 3	
		Code Ident	Mfg & Type	Code Ident	Mfg & Type	Code Ident	Mfg & Type
503100-183	R57 res. 18k 1/4W, 5%	01121	Allen Bradley CB1835	09021	Airco Speer 4R183J		
531362-008	C1, C17 cap. .1μF, 10%, 80V	56289	Sprague 192P1049R8				
530333-100	C2, 4 cap. 10pF 500V	72136	Electro Motive Mfg. Co. DM15C100J0500WV1CR	00853	Sangamo Electric D15S5C100J0		
531568-205	C3 cap. 2μF 50V	27556	IBM Electronics Products XA2A205K	84411	TRW Capacitor Division X663F2059.50W2		
819560-010	C5, 7 cap. 22μF, 20%, 20V	06751	Components Inc. TSD4-20-226				
531961-001	C6 cap. 3.3pF	56289	Sprague 10TCC-V33				
532026-001	C13, 15 cap. 220μF, 35V		Nichicon R1-A35U220				
531959-002	C14 cap. 1000μF 15V	29505	Temple GF 411 Series				
817322-070	C19 cap. .1μF, 50V	71590	Centralab CK104				
531022-005	C20 cap. .01μF, 50V	71590	Centralab CK103				
818945-010	CR1, 2, 4 diode 125PIV 50mA @ .89V	13715	Fairchild Semi-Conductor FD333				
820284-010	CR5, 7, 21, 3 diode	14433	ITT Semi-Conductor IN4148	07910	Continental Device IN914		
817167-160	CR10 diode 10V 400mW 5% 8.5 ohms @ 12.5mA	04713	Motorola IN961B				
817167-340	CR13 diode 18V 400mW 5% 21 ohms .25mW	04713	Motorola IN967B				
817162-140	CR14 diode 5.6V 400mA 5% 11 ohms @ 200mA	12954	Dickson IN752A				

Data Tech No	Description	Source 1		Source 2		Source 3	
		Code Ident	Mfg & Type	Code Ident	Mfg & Type	Code Ident	Mfg & Type
817167-280	CR15 diode 15V 400mW 5% 16 ohms @ 9.5mA	04713	Motorola IN965B				
503582-003	CR16, 17, 18, 19 diode	04713	Motorola IN4002				
503582-005	CR20, 23, 24, 25 diode	04713	Motorola IN4004				
531841-001	Q1, 4, 11 transistor	07263	Fairchild Semi-Conductor 2N5133				
531842-001	Q2, 5, 7, 9, 19 transistor	07263	Fairchild Semi-Conductor 2N5138				
817138-010	Q3 transistor	07263	Fairchild Semi-Conductor 2N3565				
819563-010	Q6 transistor	32293	Intersil ITS1001				
530489-001	Q8, 10 transistor	01295	Texas Instruments 2N3646				
530719-002	Q16 transistor	07263	Fairchild Semi-Conductor 2N3643				
822126-010	Q17 transistor	01295	Texas Instruments TIP29A				
532189-001	Q18 transistor	32293	Intersil E7028				
531948-001	A1 int ckt op amp	27014	National Semi-Conductor LM307				
531300-003	A2 int ckt op amp	01295	Texas Instruments SN72709				
531168-002	F1 fuse, 3/8A	79515	Littlefuse 175.375				
531974-001	T1 transformer		Wood Transformers 7376C				

Data Tech No	Description	Source 1		Source 2		Source 3	
		Code Ident	Mfg & Type	Code Ident	Mfg & Type	Code Ident	Mfg & Type
503048-024	W1 Wire, bus, solid awg 24	92194	Alpha Wire 299	04569	National Wire & Cable Co. N100-24	73612	Consolidated Wire & Assoc. Corp. 3819
819903-010	X1 socket I.C. 14 pin	71785	Cinch Mfg. Co. 133-51-02-004				
547829-001	Printed Wiring Board	14506	Data Technology 547829-001				



NOTES: UNLESS OTHERWISE SPECIFIED

QTY PER 20	PART # IDENTIFYING No.	ALPHABETIC STUFF OR DESCRIPTION	MATERIAL	CK'T REF	ZONE	ITEM NO
		LIST OF MATERIALS OR PARTS LIST				

UNLESS OTHERWISE SPECIFIED	DRAWN	PG. LEE	11-7-73
TOLERANCES ON	CHK'D	P. TRACY	11-7-73
DECIMALS ANGLES	APPD	N. E. STEARNS	11/14/73
.XX ± .03 ± 0° 30'	APPD	P. TRACY	11/14/73
.XXX ±			

THE INFORMATION ON THIS DRAWING WAS ORIGINALLY DEVELOPED BY THE PROPRIETARY PROPERTY OF NORTHERN DATA PRODUCTS, INC. AND IS SUBMITTED SUBJECT TO THE UNDERSTANDING THAT IT IS TO BE USED ONLY FOR THE PURPOSE FOR WHICH IT IS SUBMITTED AND THAT THE UNITED STATES OF AMERICA, NORTHERN DATA PRODUCTS, INC. COMPANY RESERVES ALL PATENT, SALE, PURCHASE AND DESIGN RIGHTS. ANY USE, REPRODUCTION, RIGHTS THEREIN NOT SPECIFICALLY GRANTED IN WRITING BY NORTHERN DATA PRODUCTS, INC. IS PROHIBITED.

ANALOG BOARD - ASSY, 3½ DIGIT DISPLAY, MODEL 4311 (UNI-POLAR)

CODE IDENT NO	SIZE	547931	K
49956	D		

SCALE 2/1 SHEET 2 of 2

NORTHERN COMPUTER FORM 67-0079

547931

Model 4311

Description Analog Board Sub-Assembly

REPLACEABLE PARTS LIST

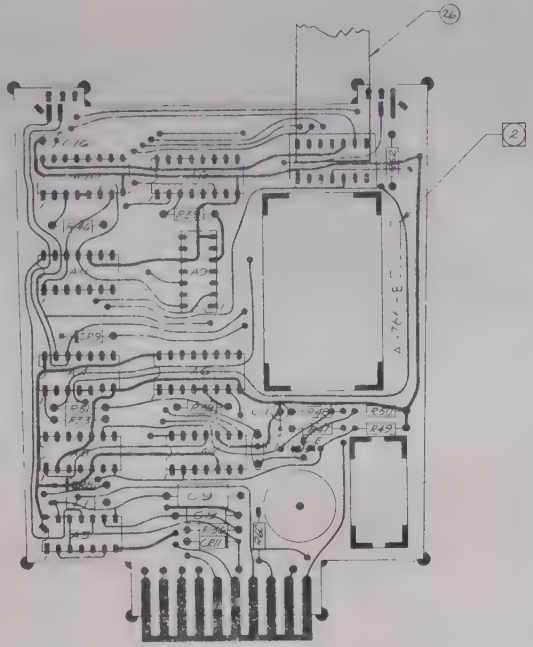
Data Tech No	Description	Source 1		Source 2		Source 3	
		Code Ident	Mfg & Type	Code Ident	Mfg & Type	Code Ident	Mfg & Type
531986-003	R1 res. (20V, 200V, 1000V) 10M 1W, 1%	03888	Pyroflim PME70				
503100-754	R2 res. (20V, 2μA) 750k 1/4W, 5%	01121	Allen Bradley CB7545	09021	Airco Speer 4R754J		
817047-380	R3 res. (20V) 101k 1/8W, 1%	19701	Electra/Midland Corp. MF6C				
817047-370	R3 res. (2μA) 100k 1/8W, 1%	19701	Electra/Midland Corp. MF6C				
817046-320	R3 res. (200V, 20μA) 10k 1/8W, 1%	19701	Electra/Midland Corp. MF6C				
817045-310	R3 res. (1000V, 200μA) 1k 1/8W, 1%	19701	Electra/Midland Corp. MF6C				
817044-300	R3 res (2mA) 100 ohms 1/8W, 1%	19701	Electra/Midland Corp. MF6C				
817044-960	R3 (20mA) 10 ohms 1/8W, 1%	19701	Electra/Midland Corp. MF6C				
819126-010	R3 res. (200mA) 1 ohm 1/2W, 1%	19701	Electra/Midland Corp. MF6C				
503100-334	R4, 9 res. 330k 1/4W, 5%	01121	Allen Bradley CB3445	09021	Airco Speer 4R334J		
503100-103	R5, 8, 24, 30 31 res. 10k 1/4W, 5%	01121	Allen Bradley CB1035	09021	Airco Speer 4R103J		
503100-182	R6, R7, 52, 54, 67 res. 1.8k 1/4W, 5%	01121	Allen Bradley CB1825	09021	Airco Speer 4R182J		
531866-014	R10 res. 100k, variable	73138	Beckman Instruments 89PR100K				
503100-154	R11, 14 res. 150k 1/4W, 5%	01121	Allen Bradley CB1545	09021	Airco Speer 4R154J		
531722-190	R12 res. 909 ohms 1% RN55D	14674	Corning Glass Works Co. Type NA55	80031	Mepco Inc. Style FE10 or MR31		

Drawing No 547931 Ref K

Data Tech No	Description	Source 1		Source 2		Source 3	
		Code Ident	Mfg & Type	Code Ident	Mfg & Type	Code Ident	Mfg & Type
531722-099	R13 res. 100 ohms 1% RN55D	14674	Corning Glass Works Co. Type NA55	80031	Mepco Inc. Style FE10 or MR31		
503100-622	R15, 16, 23 res. 6.2k, 1/4W, 5%	01121	Allen Bradley CB6225	09021	Airco Speer 4R622J		
503100-104	R17, 25 res. 100k 1/4W, 5%	01121	Allen Bradley CB1045	09021	Airco Speer 4R104J		
531866-007	R26 res. 1k variable	73138	Beckman Instruments 89PR1K				
531722-272	R27 res. 6.49k 1% RN55D	14674	Corning Glass Works Co. Type NA55	80031	Mepco Inc. Style FE10 or MR31		
503100-431	R28 res. 430 ohms 1/4W, 5%	01121	Allen Bradley CB4315	09021	Airco Speer 4R431J		
503100-222	R29 res. 2.2k 1/4W, 5%	01121	Allen Bradley CB2225	09021	Airco Speer 4R222J		
503100-102	R32 res. 1k 1/4W, 5%	01121	Allen Bradley CB1025	09021	Airco Speer 4R102J		
503100-685	R34 res. 6.8M 1/4W, 5%	01121	Allen Bradley CB6855	09021	Airco Speer 4R685J		
503100-332	R35, 55 res. 3.3k 1/4W, 5%	01121	Allen Bradley CB3325	09021	Airco Speer 4R332J		
503100-221	R53 res. 220 ohms 1/4W, 5%	01121	Allen Bradley CB2215	09021	Airco Speer 4R221J		
530213-391	R56 res. 390 ohms, 1W, 5%	56289	Sprague 239E3915				
503100-183	R57 res. 18k 1/4W, 5%	01121	Allen Bradley CB1835	09021	Airco Speer 4R183J		
530692-304	R63, 64, 66 res. 300k 1/4W, 2%	14674	Corning Glass Works Co. C4304-2				
531352-003	C1, 17 cap. .1μF, 10%, 30V	56289	Sprague 192P20292				
530333-100	C2, 4 cap. 10pF 500V	72136	Electro Motive Mfg. Co. DM15C100J0500WV1CR	00853	Sangamo Electric D15S5C100J0		
531568-205	C3 cap. 2μF 50V	27556	IBM Electronics Products XA2A205K	84411	TRW Capacitor Division X663F2059.50W2		

Data Tech No	Description	Source 1		Source 2		Source 3	
		Code Ident	Mfg & Type	Code Ident	Mfg & Type	Code Ident	Mfg & Type
819560-010	C5, 7 cap. 22μF, 20%, 20V	06751	Components Inc TSD-20-226				
531961-001	C6 cap. 3.3pF 1000WVdc	56289	Sprague 10TCC-V33				
532026-001	C13, 15 cap. 220μF, 35V		Nichicon R1-A35U220				
531959-002	C14 cap. 1000μF 15V	29505	Temple GF 411 Series				
817322-070	C19 cap. .1μF 50V	71590	Centralab CK104				
531022-005	C20 cap. .01μF, 50V	71590	Centralab CK103				
818945-010	CR1, 2, 4 diode 125PIV 50mA @ .89V	13715	Fairchild Semi-Conductor FD333				
820284-010	CR3, 5, 6, 7, 21, 26 Diode	14433	ITT Semi-Conductor IN4148	07910	Continental Device IN914		
817167-160	CR10 diode 10V 400mW 5% 8.5 ohms @ 12.5mA	04713	Motorola IN961B				
817167-340	CR13 diode 18V 400mW 5% 21 ohms .25mW	04713	Motorola IN967B				
817162-140	CR14 diode 5.6V 400mA 5% 11 ohms @ 200mA	12954	Dickson IN752A				
817167-280	CR15 diode 15V 400mW 5% 16 ohms @ 9 9.5mA	04713	Motorola IN965B				
503582-003	CR16, 17, 18, 19 diode	04713	Motorola IN4002	01295	Texas Instruments IN4002		
503582-005	CR20, 23, 24, 25 diode	04713	Motorola IN4004	01295	Texas Instruments IN4004		
531841-001	Q1, 4, 11 transistor	07263	Fairchild Semi-Conductor 2N5133				

Data Tech No	Description	Source 1		Source 2		Source 3	
		Code Ident	Mfg & Type	Code Ident	Mfg & Type	Code Ident	Mfg & Type
531842-001	Q2, 7, 9 transistor	07263	Fairchild Semi-Conductor 2N5138				
817138-010	Q3 transistor	07263	Fairchild Semi-Conductor 2N3565				
817150-050	Q8, 10 transistor	01295	Texas Instruments 2N4422				
530719-002	Q16 transistor	07263	Fairchild Semi-Conductor 2N3643				
822126-010	Q17 transistor	01295	Texas Instruments TIP21A				
531979-001	Q18 transistor	32293	Intersil 2N3954				
531948-001	A1 int ckt op amp	27014	National Semi-Conductor LM307				
531300-003	A2 int ckt op amp	01295	Texas Instruments SN72709				
531168-002	Fuse 3/8A 125V	79515	Littlefuse 275.375				
531974-001	T1 transformer, power		Wood Transformers 7376C				
503048-024	W1 wire, bus, solid awg 24	92194	Alpha Wire 299	04569	National Wire & Cable Co. N100-24	73612	Consolidated Wire & Assoc. Corp. 3819
819903-010	X1 socket, I.C. 14 pin	71785	Cinch Mfg. Co. 133-51-02-004				
547829-001	Printed Wiring Board	14506	Data Technology Corp. 547829-001				



QTY REQD	PART OR IDENTIFYING NO	NOMENCLATURE OR DESCRIPTION	MATERIAL	CKT REF	ZONE	ITEM NO.
GSI		LIST OF MATERIALS OR PARTS LIST				

UNLESS OTHERWISE SPECIFIED
TOLERANCES ON
DECIMALS ANGLES
X ± .10 ±0° 30'
X.X ± .05
3 SHARP CORNERS

DRAWN S. KADER 1/18/72
CHECK N. TRINOS 1/19/72
APPR. R.L. BOUCHARD 1/21/72
APPR. G. MILANO 1/21/72

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NEXT ASSY

MOTHER BOARD SUB-ASSY, 3 1/2 DIGIT DISPLAY MODEL 4311 & MODEL 4312

CODE IDENT NO 14506 | SIZE D | 547832 | E

SCALE 2/1 | SHEET 2 OF 2

NOTES UNLESS OTHERWISE SPECIFIED

Model 4311 and 4312

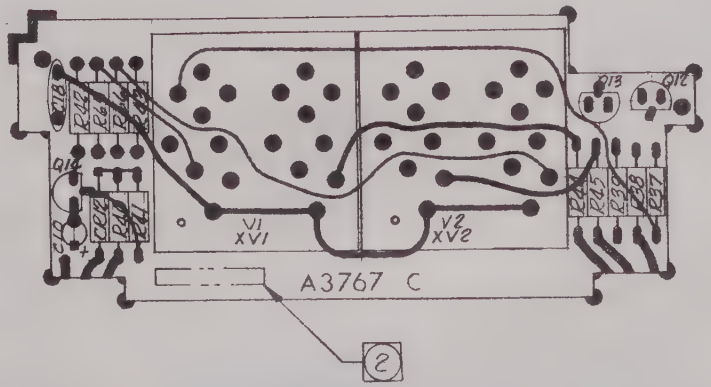
Description Mother Board Sub-Assembly

REPLACEABLE PARTS LIST

Data Tech No	Description	Source 1		Source 2		Source 3	
		Code Ident	Mfg & Type	Code Ident	Mfg & Type	Code Ident	Mfg & Type
503100-222	R33 res. 2.2k 1/4W, 5%	01121	Allen Bradley CB2225	09021	Airco Speer 4R222J		
503100-221	R36, 62 res. 220 ohms 1/4W, 5%	01121	Allen Bradley CB2215	09021	Airco Speer 4R221J		
503100-332	R46, 58, 59 res. 3.3k 1/4W, 5%	01121	Allen Bradley CB3325	09021	Airco Speer 4R332J		
503100-685	R47 res. 6.8M 1/4W, 5%	01121	Allen Bradley CB6855	09021	Airco Speer 4R685J		
503100-223	R48 res. 22k 1/4W, 5%	01121	Allen Bradley CB2235	09021	Airco Speer 4R223J		
503100-100	R49 res. 10 ohms 1/4W, 5%	01121	Allen Bradley CB1005	09021	Airco Speer 4R1005		
503100-183	R50 res. 18k 1/4W, 5%	01121	Allen Bradley CB1835	09021	Airco Speer 4R183J		
503100-103	R51 res. 10k 1/4W, 5%	01121	Allen Bradley CB1035	09021	Airco Speer 4R103J		
503100-102	R60 res. 1k 1/4W 5%	01121	Allen Bradley CB1025	09021	Airco Speer 4R102J		
819465-020	C8 cap. .001μF 200V, 10%	56289	Sprague 192P10292				
531352-001	C9 cap. .01μF 200V, 10%	56289	Sprague 192P10392	14936	General Instruments Corp. 165C103K		
531352-006	C11 cap. .068μF, 10%	56289	Sprague 192P6839R8				
818131-010	C12 cap. .001μF 1kV, 10%	71590	Centralab DD-102				
818337-040	C16 cap. 3.3μF, 15V	22229	Union Carbide K3R3E15				

Drawing No 547832 Ref E

Data Tech No	Description	Source 1		Source 2		Source 3	
		Code Ident	Mfg & Type	Code Ident	Mfg & Type	Code Ident	Mfg & Type
820284-010	CR8, 9, 11 diode	07910	Continental Devices IN914	14433	ITT Semi-Conductor IN4148	01295	Texas Instruments IN914-IN4148
531945-001	Q15 transistor, unijunction	04713	Motorola MPU131				
531359-003	A3 int ckt, quad 2 input NAND gate	04713	Motorola MC7400P	27014	National Semi-Conductor SN7400N	56289	Sprague USN7400A
531359-013	A4 int ckt, hex inverter	04713	Motorola MC7404P	01295	Texas Instruments SN7404N	27014	National Semi-Conductor SN7404N
814951-010	A5, 7, 9, 11 int ckt, decade ctr	01295	Texas Instruments SN7490AN	27014	National Semi-Conductor DM3530N		
531938-001	A6, 8, 10 int ckt, decoder		Sperry Information Displays Division DD-700	27014	National Semi-Conductor DM8880N		
531958-334	L1 inductor 330μH	99800	Delevan Electronics Corp. 1025-80				
547831-001	Printed Wiring Board	14506	Data Technology Corp. 547831-001				



547834 REV B

REVISIONS

SYM	DESCRIPTION	DATE	CHKD	APVD
	FIRST ISSUE			

-10	-60	10	-40	-30	-20	-10	ITEM	PART NO	CODE IDENT NO	DESCRIPTION	REMARKS

QUANTITY PER ASSEMBLY

PARTS LIST

UNLESS OTHERWISE SPECIFIED

INTERPRET PER MIL-D-1000
REMOVE BURRS AND SHARP EDGES
DIMENSIONS ARE IN INCHES AND APPLY BEFORE PLATING OR COATING
COMMERCIAL TOLERANCES APPLY TO STOCK SIZES
DO NOT SCALE THIS PRINT

TOLERANCES
FRACTIONS ± | TWO PLACE DECIMALS ± .01 | THREE PLACE DECIMALS ± .005 | ANGLES ±

MATERIAL	FINISH

NEXT ASSEMBLY	USED ON	APPLICATION	QUANTITY

DRAWN J. [illegible] 4/11/72
CHECKED W. Suggs 4/11/72
APPROVED [illegible] 4/11/72
APPROVED [illegible] 4/11/72
APPROVED
APPROVED
RELEASE DATE
MFWD RADIUS
HEAT TREAT

TITLE
DISPLAY BOARD SUB-ASSY,
3½ DIGIT DISPLAY
MODEL 4311 & MODEL 4312

SIZE	CODE IDENT NO	DRAWING NO	REV
C	14506	547834	B

SCALE 2/1 | CONTRACT NO | SHEET 2 OF 2

Description Display Board Sub-Assembly

Data Tech No	Description	Source 1		Source 2		Source 3	
		Code Ident	Mfg & Type	Code Ident	Mfg & Type	Code Ident	Mfg & Type
503100-153	R37, 42 res. 15K 1/4, 5%	01121	Allen Bradley CB1535	09021	Airco Speer 4R153J		
503100-473	R38, 43, 44, 45 res. 47k 1/4W, 5%	01121	Allen Bradley CB4735	09021	Airco Speer 4R473J		
503100-303	R39 res. 30K 1/4, 5%	01121	Allen Bradley CB3035	09021	Airco Speer 4R303J		
503100-154	R40 res. 150k 1/4W, 5%	01121	Allen Bradley CB1545	09021	Airco Speer 4R154J		
503100-103	R41 res. 10k 1/4W, 5%	01121	Allen Bradley CB1035	09021	Airco Speer 4R103J		
503100-336	R65, 66 res. 33M 1/4W, 5%	01121	Allen Bradley CB3365	09021	Airco Speer 4R336J		
818337-040	C10 cap. 3.3μF 15V	22229	Union Carvide K3R3E15				
818131-070	C18 cap. 0.002μF 1kV	71590	Centralab DD-202				
820284-010	CR12 diode	14433	ITT Semi-Conductor 1N4148	07910	Continental Device 1N914		
531952-001	Q12, 13, 14 transistor	04713	Motorola 2N5550	13715	Fairchild Semi-Conductor 2N5550		
531941-001	V1 display, ±1-1/2 digit	07187	Sperry Information Displays Division SP751				
531942-001	V2 display, 2 digit	07187	Sperry Information Displays Division SP752				
547833-001	Printed Wiring Board	14506	Data Technology 547833-001				

Drawing No 547834 Ref B

COMPLETE AND AFFIX THIS CARD TO AN ASSEMBLY BEING RETURNED TO THE FACTORY.

Send it to:

DATA TECH, 2700 South Fairview Street, Santa Ana, California 92704
Attention: Product Service

Equipment:

Model _____ Serial Number _____ Purchase Date _____

Original P/O Number _____ Repair P/O Number _____

REASON FOR RETURN/MALFUNCTION SYMPTOMS _____

_____

_____

After repair, please return this unit to:

_____

_____

_____

Bill non-warranty repairs to:

_____

_____

_____

Non-warranty repairs authorized if not to exceed $_____

Authorized by _____ Telephone No. (____) _____

This card provides a means of expanding communications between Data Tech and its customers. Entries aid Data Tech in selecting programs which are consistant with customer requirements. Your efforts are, therefore, very much sought and appreciated.

Name _____ Address _____

City _____ State _____ Zip Code _____

Model _____ Repeat Customer: Yes _____ No _____

Delivery: Good ____ Satisfactory ____ Poor ____ Manual: Good ____ Satisfactory ____ Poor ____

Appearance: Attractive ____ Needs Improvement ____

Who/What introduced Data Technology: Rep ____ Ad ____ Other ____

Additional features desired: _____

_____

Best liked features: _____

Application: _____

_____

Comments/Suggestions: _____

_____

_____

_____

Enclose with return equipment

Do not mail separately

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